IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION
HEALTHY PLEASURABLE INHALATION DEVICE

Background of the Invention.

The field of the invention pertains to oral devices that provide a pleasurable experience. Foods and similar items, such as chewing gum, provide such experiences. Non-food items, such as cigarettes, cigars, smoking pipes and chewing tobacco, also provide such experiences. Disclosed below is a device intended to healthfully substitute for cigarettes, cigars and smoking pipes, in particular.

The human respiratory tract can be divided into upper and lower airways. The upper airway tract includes the nose, mouth, pharynx and larynx. The lower airway tract consists of the trachea, bronchi and bronchioles. The division between the upper and lower airways is usually taken as the junction of the larynx and the trachea. The new device, and its technology, is based on oral inhalation.

Considering the oral airway tract, the passage for oral flow can also be divided into three regions: (1) the entrance consisting of lips, front teeth and the leading edge of the tongue, (2) the middle region and arching channel bounded by the tongue and the hard palate, and (3) the oral pharynx where the passage joins the nasopharynx and the flow becomes vertical. While the flow rate of air obviously varies, the flow rate is assumed to be 0.5 L/sec.

Summary of the Invention.

An objective of the invention is to enable people to "enjoy" the sensation of inhalation. The invention in its fundamental form consists of a generally tubular device with a mouthpiece. The tubular portion contains a flavored powder and a configuration that meters the flow of powder into the air stream leading to the mouth. The size and shape of the tubular portion can vary, depending on the amount of powder capacity desired for the device and also depending on appearance and comfort factors pertinent to the users.

Use of the new device is somewhat similar to the use of smoking tobacco. When the user inhales through the mouthpiece, fresh air flows into the distal end, through the internal configuration of the tubular portion and mouthpiece, and then

into the user's mouth. With each inhalation, flavored powder is mixed with the flowing air to be deposited in the user's mouth.

Upon inhalation, the powder particles deposit on the tongue, in particular. Since the human tongue is particularly sensitive to taste and certain nasal passages sense smell during exhalation, the brain develops a pleasurable experience with the device. By design, the device causes deposit of the powder in the front portion of the respiratory tract, namely from the teeth to the middle portion of the palate. Deposition of the powder in this portion of the respiratory tract is important because the powder can cause bitterness if the powder particles reach the pharynx.

The device is designed to control the two-phase flow (of air and powder) for deposit of the powder particles in the first and second regions and to avoid deposit of particles in the third region and beyond. To achieve this particular result with the two-phase flow, the new device allows variation of the following physical aspects: the airflow speed, volumetric airflow rate, airflow direction, the powder density, powder particle size and quickness of powder solubility in saliva.

Description of the Drawings.

FIG. 1 is a perspective view of the first embodiment of the device;

FIG. 2 is a longitudinal cross-section of the device of FIG. 1;

FIG. 3A is an end view of the mouthpiece of FIG. 1;

FIG. 3B is a cross-section of the mouthpiece of FIG. 1;

FIG. 3C is a perspective view of the mouthpiece of FIG. 1;

FIG. 4A is a cross-section of a gate shown in FIG. 2;

FIG. 4B is a perspective view of a gate shown in FIG. 2;

FIG. 5A is an end view demonstrating the airflow of the angled channels in FIG. 3B;

FIG. 5B is a side view demonstrating the airflow of the angled channels in FIG. 3B;

FIG. 6 is a longitudinal cross-section of the second embodiment of the device;

FIG. 7 is a longitudinal cross-section of the third embodiment of the device;

FIG. 8 is a longitudinal cross-section of the fourth embodiment of the device;

FIG. 9A is a longitudinal cross-section of the mouthpiece of the fourth embodiment;

FIG. 9B is an inner end view of the mouthpiece of FIG. 9A;

FIG. 10 is a longitudinal cross-section of the fifth embodiment of the device;

FIG. 11A is a longitudinal cross-section of an alternative mouthpiece for the device of FIG. 10;

FIG. 11B is an end view of the mouthpiece of FIG. 11A;

FIG. 12 is a longitudinal cross-section of the device of FIG. 10 with the mouthpiece of FIG. 11;

FIG. 13 is a partial longitudinal cross-section of a further modification of the device of FIGs. 10-12;

FIG. 14 is a longitudinal cross-section of the complete device of FIG. 13;

FIG. 15 is a longitudinal cross-section of the sixth embodiment of the device, including a filter adjacent the mouthpiece;

FIG. 15A is a plan view of the filter of FIG. 15;

FIG. 16 is a plan view of an alternate form of the filter of FIG. 15;

FIG. 17 is a longitudinal cross-section of the seventh embodiment of the device;

FIG. 18 is a plan view of the inner tube cap in the device of FIG. 17;

FIG. 19 is a perspective view of an optional non-cylindrical mouthpiece;

FIG. 20 is a longitudinal cross-section of the device of FIG. 17 with the mouthpiece of FIG. 19 attached;

FIG. 21A is a perspective view of a modified distal end cap;

FIG. 21B is a longitudinal cross-section of the end cap of FIG. 21A;

FIG. 21C is a plan view of the end cap of FIG. 21A;

FIG. 22A is a plan view of an inner sealing strip;

FIG. 22B is a perspective view of the folded inner sealing strip;

FIG. 23A is a partial longitudinal cross-section of the device showing the modified end cap of FIG. 21 and the sealing strip of FIG. 22;

FIG. 23B is a partial perspective view of the end cap and sealing strip assembled together;

FIG. 24 is a longitudinal cross-section of the device showing the sealing strip partially removed;

FIG. 25 is a longitudinal cross-section of the device showing the sealing strip fully removed;

FIG. 26 is a longitudinal cross-section of the eighth embodiment of the device;

FIG. 26A is a distal end view of the device of FIG. 26;

FIG. 26B is a lateral cross-section view of the device of FIG. 26;

FIG. 27A is a partial side view of the mouthpiece of the device of FIG. 26;

FIG. 27B is a longitudinal partial cross-section of the mouthpiece of the device of FIG. 26;

FIG. 27C is an end view of the mouthpiece of the device of FIG. 26;

FIG. 28A is a lateral cross-section of a modified distal end for the device of FIG. 26;

FIG. 28B is a horizontal longitudinal partial cross-section of the distal end of FIG. 28A;

FIG. 28C is a vertical longitudinal partial cross-section taken along the line 28C of FIG. 28A; and

FIG. 28D is a second lateral cross-section taken along the line 28D of FIG. 28B.

Description of the Preferred Embodiments.

Illustrated in FIG. 1 is the basic external appearance of the device. There is a mouth portion or mouthpiece 1, a cylindrical main body 2 that is hollow or tubular, and a distal end filter or end cap 3 to admit air into the device. In general, the device is somewhat thicker and longer than a cigarette but thinner and shorter than a large cigar.

In FIG. 2 when there is no airflow drawn through the device, a flavored powder 17 is confined in the area between pushup ring 16, inner tube 13, outer tube 14, lower gate 25 and upper gate 18. When a user inhales, air 11 flows into the device through distal end filter 3. The air then flows through inner tube 13 and channel 23 of the lower gate 25 toward upper gate 18. Before the air reaches channel 24 of upper gate 18, the air flows through a region containing the flavored powder 17. The air entrains a certain amount of powder and becomes a two-phase flow through channel 24 of upper gate 18. The two-phase flow 21 passes through channel 20 in the mouthpiece 19 and finally into the mouth through angled channel 27.

As air passes through the region between the lower gate 25 and upper gate 18 and the flavored powder becomes entrained, additional powder is continuously supplied to this region in response to the compression spring 15 acting against the ring 16 and powder 17.

The angled channels 27 at the exit of the mouthpiece 19 direct the two-phase flow at an angle selected to distribute the powder in the user's mouth and avoid passage of powder into the pharynx. The powder will impinge the user's tongue, palate and other surfaces normally coated with saliva, rather than pass further to the pharynx.

FIG. 3 further illustrates the structure of the mouthpiece 19. The number of angled channels 27 can vary from one to any number depending upon channel diameter and mouthpiece diameter. Minimum channel diameter is limited by any tendency of the powder to clog in the channels 27. The cross-sectional shape of the channels 27 can be varied for different purposes, for example, to suit various manufacturing processes.

Illustrated in FIG. 4 is the structure of either the lower gate 25 or the upper gate 18. The gates need not be of identical size, and it may be preferential to make the passages 24 of the upper gate 18 somewhat larger to accommodate the two-phase flow as powder becomes entrained in the air.

FIG. 5 illustrates test results showing the flow patterns of the two-phase flow exiting the angled channels 27 into the user's mouth. The two-phase flow clearly spreads widely from the mouthpiece 19 as intended.

FIG. 6 illustrates a device including a duckbill check valve 36. Powder 17 is contained in the space between the inner tube 35, push plate 34 and the duckbill valve 36. A compression spring 32 continuously urges the powder 17 toward the duckbill valve 36. Absent inhalation, although the spring 32 pushes the powder 17 toward the duckbill check valve 36 opening 39, the friction among the powder particles and the friction between the powder and the duckbill check valve prevent the powder from exiting the duckbill valve opening 39.

When air is inhaled through the filter or end cap 31, the air flows 46 through the space 33 between the inner tube 35 and outer tube 42. The air flows into a gap 41 and on into the duckbill check valve 36 picking up powder 17 in the space 43 leading 37 to the opening 39. Exiting the opening 39, the two-phase powder and

airflow passes through the channel 27 in the mouthpiece 19 and exits 21 into the user's mouth.

Illustrated in FIG. 7 is a third embodiment of the device wherein air is drawn in through a filter or end cap 59 and then into a space 56 in the tube 53 containing a compression spring 57. The compression spring 57 acts against a spring plate 55 made of a porous material that allows air to pass through, but does not permit the powder 17 to pass into, space 56. The powder 17 is of sufficient particle size to permit air to flow there through and entrain some powder in the region 52. With the entrained particles, two-phase flow occurs in channel 51 of the mouthpiece 19 and the flow enters the mouth as shown at 21. As powder 17 is used, spring 57 continues to compress powder 17 to re-supply region 52 with adequate powder.

FIGs. 8 and 9 illustrate a fourth embodiment comprising modifications to the previous device. Upon inhalation, air 81 flows in both through the filter or end cap 69 and through an annular filter 72. The air inhaled through filter 69 passes into space 66 also containing spring 67. The air continues through the powder 17, entrains powder in region 60 forming two-phase flow in channel 61 of mouthpiece 62. The annular filter 72 in tube sidewall 63 leads to a plurality of slots 71 between the powder 17 and mouthpiece 62. The flow of additional air through slots 71 entrains additional powder mixing in with the two-phase flow in channel 61. The two-phase flow exits the mouthpiece 62 at 21. A further optional modification comprises a non-porous spring plate 65 forcing all inhalation to be through filter 72 and slots 71.

Illustrated in FIG. 10 is a spiral core based design wherein the spring is eliminated and a spiral core 86 is located inside the tube 89. The powder is loosely placed 85 within the spiral core 86. Upon inhalation, air 88 passes through filter 87 and through the powder and spiral core 86. As the air passes through the spiral core 86 and powder, a portion of the powder is entrained, creating two-phase flow entering channel 83 in the mouthpiece 82. The spiral core 86 creates a circulating airflow that eventually entrains all of the powder as inhalation continues. The two-phase flow then exits the mouthpiece 82 as indicated at 81. An annular filter 84 admits additional air to adjust the mix ratio of entrained powder to air in channel 83.

The spiral core 86 lessens the likelihood that the powder will fall and compact when the device is held vertically. The pitch of the spiral core 86 should be made small to control the powder. During inhalation, the device is most likely close to

horizontal but otherwise is likely to be almost vertical when packaged, shipped or stored.

In the mouthpiece 82 used in FIG. 10, the two-phase flow leaves the mouthpiece from locations very close to the edge of the mouthpiece. Since the human mouth is usually wet due to saliva, the outlets from the mouthpiece can be blocked by the mixture of saliva and powder particles. To avoid blockage, the mouthpiece 82 is modified by locating the outlet nearer the mouthpiece centerline but retaining the angle of the outlet.

As illustrated in FIG. 11, the modified mouthpiece 90 two-phase flow channel 97 leads to two small channels 91 which angle at 92 to openings 94 and 95 near the centerline of the mouthpiece. The two-phase flow 93 thus enters the mouth from near the center of the mouthpiece. FIG. 12 illustrates the modified mouthpiece 90 mounted on the device of FIG. 10.

In FIGs. 13 and 14, the spiral core 100 of FIGs. 10 and 12 is modified to a spring-like configuration that is attached to the mouthpiece 101. The spiral core 100 loosely fits within the tube 102 and abuts the distal end 105 at 103. By pushing on the mouthpiece 101, the spiral core 100 can be compressed and released to disturb the powder in space 104 thereby eliminating the setting or blocking of the powder which can occur with settling over time.

In the sixth embodiment shown in FIGs. 15 and 16, a filter 136 is positioned at the entrance to the mouthpiece 101 beyond the tube 102 and spiral core 100. By adjusting the size of the holes 138, the ratio of powder particles in the two-phase flow can be controlled. Moreover, the shapes of the holes 138 also affect the two-phase flow performance. For example, as shown in FIG. 16, the holes can be circular shaped 140, pentagon shaped 141 or triangular shaped 142 and of differing size 139.

Illustrated in FIGs. 17 and 18 is the seventh embodiment of the device wherein an inner tube 111 is axially located relative to the outer tube 112 thereby providing an annular gap 106. Powder 105 is located in the inner tube 111, and the inner tube is formed with holes 118 leading to the annular gap 106. Powder 105 tends to flow through holes 118 into gap 106, as shown at 110. When a user inhales, airflow 107 enters the distal end 87 and moves 108 through the gap 106 entraining powder 110 to form a two-phase flow 109. The two-phase flow then enters the mouthpiece 113 and flows out through passage 116.

The inner tube includes caps 114 and 115, as shown in FIG. 18, and is formed with tabs 120 allowing passages for the annular gap 106.

Another modification of the mouthpiece is shown at 130 in FIG. 19. The modified mouthpiece 130 is generally oval shaped with the major axis horizontal and minor axis vertical in normal use by a user standing or sitting up. With the mouthpiece 130 properly mounted on the tube 112, as best shown in FIG. 20, the row of holes 118 faces downwardly allowing the powder 105 to utilize gravity to exit the inner tube 111 into the annular gap 106. As above, the air in the annular gap 106 becomes two-phase flow 109 and exits the mouthpiece at 131.

The holes 118 in the inner tube 111 of the seventh embodiment must be sealed during shipment and storage prior to use. Illustrated in FIG. 21 is a modified end cap or filter 150 having a solid end 156 that is inserted in inner tube 111 to seal the tube end. When in use, air flows from the inner cavity 154 of the cap 150 through slots 151 and into annular gap 106 between inner tube 111 and outer tube 112.

FIG. 22A shows the structure of a sealing strip 140 used to block the holes 118 of inner tube 111. The sealing strip is preferably paper with perforated lines 145 and 146 near the center of the sealing strip. These two perforated lines 145 and 146 provide convenient bending lines to bend the sealing strip into the shape shown at 147 in FIG. 22B. Near the ends 141 and 143 of the sealing strip 147 are two additional perforated lines 142 and 144 for separating the ends by force. The sealing strip 140 is bent into the shape 147 prior to assembly about the holes 118.

FIG. 23A illustrates the sealing strip 147 inside the device between the inner tube 111 and the outer tube 112 to seal the holes 118 and prevent powder from leaking into the annular gap 106. FIG. 23B illustrates the sealing strip 147 wrapped about the distal end cap 150. The sealing strip 147 fits into notches 153 and 158 in the end cap 150. The notches 153 and 158 allow the strip 147 to slide lengthwise when the user grasps the central part 148 of the strip.

As shown in FIGs. 24 and 25, the user pulls the sealing strip 147 out exposing holes 118 in the inner tube 111 and uncovering the powder thereby allowing a portion to flow into the annular gap 106. Since the two sealing strip ends 141 and 143 are larger than the notches 153 and 158 in end cap 150, FIG. 21, they cannot pass through the notches. Rather, the sealing strip breaks at perforated lines 142 and 144 leaving

the ends 141 and 143 jammed in notches 153 and 158 and preventing loss of powder through notches 153 and 158.

Illustrated in FIG. 26 is a further modification of the device. The device 200 comprises two hemi-cylindrical lumens or tubes 201 and 202. Tubes 201 and 202 are divided by a partition 205. Tube 202 contains powder 204 prior to use. As indicated by 203, there is an opening between tubes 201 and 202.

On the distal end 206 of the device 200, there is a metering slot 207 which allows airflow 208 to pass into tube 201. When a user inhales at the end 210 of the mouthpiece 209, air 208 flows through the slot 207 and mixes with the powder near the bottom 217 of the device 200. The flow then becomes an air-powder two-phase flow 219 that passes through the mouthpiece 209 into the user's mouth.

A thin film door 211 is located near the distal end 206. The door 211 is normally closed, preventing powder near the bottom 217 from moving into the tube 201, unless air 208 is drawn in by the user, forcing the door open.

FIG. 27 illustrates in detail the mouthpiece 209 configuration. As the air-powder flow 219 enters the mouthpiece 209, a barrier 255 forces the lower portion 216 of the flow toward the upper portion 218 of the flow becoming the flow 220. The flow 220 is then re-directed 221 by surface 212 at an angle 213 just before entering the user's mouth. The weight of the powder particles causes the powder to be preferentially deposited on the tongue and surrounding saliva-coated tissues of the mouth.

Illustrated in FIG. 28 is an alternative form of the distal end for the embodiment of FIG. 26. Powder from tube 202 flows in the direction 232 through channel 230 and on into tube 201. The powder does not directly flow into tube 201 after flowing into channel 230 but rather the barrier 250 forces the powder to move in directions 234 and 235 to reach openings 251 and 252. The barrier 250 reduces the tendency of the powder to randomly flow into tube 201 and thus partially serves the purpose of thin films 211 above. The size of channel 230 can be designed to increase or decrease the flow of powder and therefore serves to meter the flow of powder.

Airflow 236, 237 and 238 from the environment passes through air slots 240, 241 and 242. Referring to FIGs. 28A and C, airflow 237 carries the powder after flow in the directions 234 and 235 into tube 201 as a two-phase flow (air and powder). The sizes of slots 240, 241 and 242 are designed to meter the flow rate of entering air.

It should be noted that the mouthpiece 209 is configured such that the user naturally knows the orientation of the device to enable gravity 260 to move powder from tube 202 into tube 201, as shown in FIG. 26. During manufacture, a piece of material may be inserted into channel 230 through slot 240 to prevent powder from exiting tube 202. Just before use, the piece of material is merely extracted from slot 240.

The mouthpiece, as disclosed above, is designed to direct the air-powder mixture oblique to the throat and thereby avoid a direct path to the throat. The powder particles are sized to encourage deposit on the tongue and within the mouth tract. Preferably, the particle size is 100-250 mm. Flavor powder granules work well. The granulation processes combine all the ingredients, such as sugar, citric acid and flavor powder (coffee, mint, strawberry, etc.) into individual granules. Alternatively, sugar granules, citrus granules and flavor powder in granule form can be mixed together.

Suitable flavor powders are available under the Durarome® brand produced by Firmenick, of Geneva, Switzerland. These powders are encapsulated with a substance that quickly dissolves in the mouth, thereby quickly releasing the flavor. A fine silicate anti-caking agent may be added.